APPENDIX J

FRUIT FLY BIOLOGY AND HYPOTHETICAL SCENARIO

FRUIT FLY LIFE-CYCLE AND PHYSICAL CHARACATERISTICS

Drosophila flies (also known as pomace flies, vinegar flies banana flies, and small fruit flies) belong to the fly (Class Insecta, order Diptera) family Drosophilidae. Although most commonly referred to as "fruit flies," only flies of the family Tephritidae are true fruit flies. Drosophila flies are typically about 2.5 to 5 millimeters (1.1 to 1.5 inches) in length, fold their transparent wings over their backs horizontal to the ground, are yellowish brown to dark brown in color, fly in circular patterns, and have red eyes. They are strong fliers, having been observed to fly over 15 kilometers (6.5 miles) in 24 hours. Drosophila is most active in the morning and evening but, depending on light and weather, may be active at any time of day.

Drosophila, as do all flies, go through a complete metamorphosis, that is they progress from egg, to larva, to pupa, to adult. The adults emerge from eggs in 8 to 10 days; the adults may live for up to three months and lay from 500 to 2,000 eggs. Drosophila eggs are deposited as long as a food source is available, and resultant adults may emerge daily until the food source or the fly population is eliminated. Food sources can be as unexpected as an alcohol-based ink, mop water, or drainage-saturated soil. The adults also carry fungi spores that are deposited with the eggs and contribute to and hasten fermentation.

Drosophila metamorphosis:

Egg (2 – 24 hours) – larva (4 - 6 days) – pupa (2 – 4 days) – adult (up to 24 hours).

As indicated in the summary and overall timelines, the natural life history characteristics, life cycle, and adaptability of Drosophila fit perfectly with the opportunity in September 1998 to enter the contaminated 241-ER-152 Diversion Pit, as hypothesized below.

HYPOTHESIS OF THE FRUIT FLY SCENARIO

Following is a hypothesis of the likely fruit-fly scenario, beginning in the 241-ER-152 Diversion Pit and moving to the MO-967 Mobile Office.

- Evidence indicates that the primary opportunity for fruit flies to enter the pit was while the cover blocks were off for about 3 hours on September 15 and potentially through miscellaneous engineered penetrations.

- When the cover blocks were replaced, some fruit flies remained in the pit. They likely fed on the glycerin/monosaccharide-based fixative covering the contamination and became contaminated. While they were in the pit, they laid eggs.

- The eggs became larvae and the larvae matured into adult fruit flies around September 25.

- The contaminated adult fruit flies began to emerge from the pit through unsealed joints between the cover blocks, valve-handle penetrations, and wire ways.

- As the fruit flies emerged on September 25, the prevailing wind was blowing from the northwest, theoretically bringing with it the attractant odors from the MO-967 Mobile Office dumpster and lunchroom. The 241-ER-152 Diversion Pit was downwind from the MO-967 Mobile Office (NW to SE). NOTE: Winds were recorded as averaging 11.3 kilometers (7 miles) per hour from the northwest, variable from the east, and 11.3 kilometers (7 miles) per hour from the west-northwest.

- During the 3-day period from September 25 to 28, the wind direction shifted, placing the MO-967 Mobile Office downwind from the 241-ER-152 Diversion Pit. The new wind direction carried the fruit flies from the pit toward the northwest, allowing the flies to reach other locations (notably the MO-967 Mobile Office). NOTE: On September 26, wind averages were 10 kilometers (6 miles) per hour from the north-northwest, 10 kilometers (6 miles) per hour from the northeast, and variant from 3 to 11.3 kilometers (2 to 7 miles) per hour. On September 27, wind averages were east-northeast at 5 kilometers (3 miles) per hour, southeast at 11.3 kilometers (7 miles) per hour, and variant at 3 kilometers (2 miles) per hour. On September 28, wind averages were southeast at 12.9 kilometers (8 miles) per hour northeast at 5 kilometers (3 miles) per hour, and southeast at 8 kilometers (5 miles) per hour.